



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/679,796	10/05/2000	Satyavolu Papa Rao	TI-29098	8657

23494 7590 02/03/2004

TEXAS INSTRUMENTS INCORPORATED
P O BOX 655474, M/S 3999
DALLAS, TX 75265

EXAMINER

BAYAT, ALI

ART UNIT	PAPER NUMBER
----------	--------------

2625

DATE MAILED: 02/03/2004

5

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/679,796

Applicant(s)

RAO ET AL.

Examiner

Ali Bayat

Art Unit

2625

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) ____ is/are allowed.
- 6) ☐ Claim(s) 1-15, 17, 19 is/are rejected.
- 7) ☒ Claim(s) 16 and 18 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 05 October 2000 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 13) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
- a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-7 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1, lines 9-10 the phrase " semiconductor wafer may be inserted therebetween" is unclear to the Examiner. Please clarify that semiconductor wafer is inserted or not inserted.

Claims 2-7 are rejected under 35 U.S.C. 112, second paragraph 35 U.S.C. 112: because they are depending from rejected claim 1.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-15, 17 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liu (U.S. 5,966,424) in view of Sullivan et al.(U.S. 6,414,752).

In regard to claim 1, Lui provides for a system for imaging a semiconductor wafer to detect defects therein, comprising: an x-ray source for generating collimated x-rays (Fig.1 element 100, col. 2 lines 13-45); a first aperture array, having a plurality of

Art Unit: 2625

openings therethrough through which the collimated x-rays are substantially transmitted (Fig.1 element 102, col.2 lines 13-45); a second aperture array, having a plurality of openings therethrough through which x-rays may be substantially transmitted (Fig.1 element 104, col.2 lines 13-45), the opening of the second aperture array being aligned with openings of the first and second aperture arrays spaced apart from one another so that a semiconductor wafer may be inserted therebetween, the first aperture array being nearer the x-ray source than the second aperture array (Fig.1 element 102, first aperture is closer to element 100, X-ray source, than second aperture, element 104, in Fig.1); a detector array for detecting x-ray energy transmitted through the openings of the second aperture array (Fig.1 element 104, col.2 lines 29-30); and an analysis computer (col.2 lines 50-54), coupled to the detector array, to receive signals therefrom corresponding to the detected x-ray energy (Fig.1 element 104). But Liu does not specifically provide for a semiconductor wafer to be inserted therebetween two apertures. However in the same field of endeavor Sullivan provides for above limitation (Fig.8 col.7 lines 40-50). It would have been obvious to a person of ordinary skill in the art at time the invention was made to incorporate the teaching of Sullivan with the system and method of Lui, because Sullivan teaches a system for inspecting a wafer, including inspecting both sides of a dual sided wafer or specimen, col.2 lines 47-49).

With regard to claim 2, Lui provides for a system, wherein the first and second aperture arrays each comprise a film of high atomic number metal, through which the openings are disposed (col.3 lines 15-17, note x-ray opaque filter).

Art Unit: 2625

As to claim 3, Lui provides for a system, wherein the x-ray source comprises: a rotating anode x-ray source (col.2 lines 45-48, note during the image acquisition, as described, the filter or multipartite collimator and the imager will be repositioned three times).

In regard to claim 4, Lui provides for a system, wherein the x-ray source comprises: a wavelength-tunable x-ray source (col.3 lines 25-30).

With regard to claims 5 and 6, Lui provides for translation system in Fig.1 elements 102 and 104 (col.2 lines 27-29), but does not specifically provide for a wafer translation system, for controllably translating the semiconductor wafer when disposed between the first and second aperture arrays. However Sullivan teaches the above limitation (col.4 lines 1-10).

As to claim 7, Lui provides for a system, wherein the detector array comprises: a plurality of solid-state x-ray detectors, each associated with one of the plurality of openings of the second aperture array, each for generating a signal corresponding to the magnitude of x-ray energy transmitted through its associated opening the second aperture array (Fig.1 element 104), and for communicating the signal to the analysis computer (col.2 lines 50-54).

In regard to claim 8. See claim 1 above. It recites similar limitations as claim 8. Hence it is similarly analyzed and rejected.

With regard to claims 9 and 10 see claim 1 above. They recite similar limitations as claim 1. Hence they are similarly analyzed and rejected.

As to claim 11, Lui provides for a method, wherein the generating step comprises: communicating a signal from each of the plurality of detectors to an analysis computer (col.2 lines 50-54), the signal corresponding to the magnitude of x-ray radiation detected by the detector (Fig.1 element 104); but Lui does not provide for operating the analysis computer to associate the communicated signals with a spatial location for the wafer. However Sullivan teaches the above limitation (col.10 lines 4-12 note after initial scan, the wafer is translated to a position as shown in Fig. 5B).

With regard to claims 12 and 13 Sullivan provide for irradiating and detecting steps are performed for a first location of the semiconductor wafer relative to the pluralities of opening through the first and second aperture arrays (col.10 lines 4-12 note after initial scan, the wafer is translated to a position as shown in Fig. 5B); and further comprising: after the detecting step, laterally translating the semiconductor wafer to a second location relative to the pluralities of openings through the first and second aperture array (col.10 lines 4-12); after the translating step, repeating the irradiating and detecting steps for the wafer at the second location (Fig.6 element 605 col.10 lines 35-40).

As to claim14, Sullivan provide for a method, further comprising: after each of the detecting steps, communicating a signal from each of the plurality of detectors to an analysis computer, the signal corresponding to the magnitude of x-ray radiation detected by the detector (col.10 lines 65-67); operating the analysis computer to store digital data corresponding to the communicated signal from each of the plurality of detectors, the digital data stored in association with the location of the semiconductor

Art Unit: 2625

wafer relative to the pluralities of openings through the first and second aperture arrays(col.10 lines 3-12, note "portion marked "B" in Fig. 5A is scanned. As shown therein, greater than 50 percent of the specimen 111 is scanned so that the overlapping portion may be stitched with the second scan." Therefor storage of digital data in association with the location of the semiconductor wafer is inherited in the system of Sullivan.

With regard to claim15, Sullivan provides for a method, further comprising: generating an image of the semiconductor wafer from the store digital data (col.4 lines 7-10).

As to claim 17, Sullivan provides for a method, further comprising: repeating the placing, irradiating, detecting, communicating, and operating steps for a plurality of semiconductor wafers (col.9 lines 1-7); and comparing the digital data stored in associating with the locations of the plurality of semiconductor wafers (fig.6 element 611, col.10 lines 63-67).

With regard to claim 19, Sullivan provides for a method, further comprising: operating the analysis computer (col.10 lines 65-67) to perform spatial processing of detected defects (col.10 lines 59-61).

Allowable Subject Matter

3. Claims 16 and 18 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Art Unit: 2625

Conclusion

4. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

U.S. patent 4,266,135 to Kuwik et al. is cited for method of determining collimator aperture efficiency and apparatus with and efficient collimator aperture size.

U.S. patent 6,031,892 to Karellas is cited for system for quantitative radiographic imaging.

U.S. patent 5,802,137 to Wilkins is cited for x-ray optics, especially for phase contrast imaging.

U.S. patent 5,245,191 to Barber et al. is cited for semiconductor sensor for gamma-ray tomographic imaging system.

U.S. patent 4,206,360 to LeMay is cited for Radiography.

U.S. patent 3,723,873 is cited to Witteles is cited for radiation method for determining semiconductor stability and reliability.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ali Bayat whose telephone number is 703-306-5915.

The examiner can normally be reached on M-Thur 9:00-7:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bhavesh Mehta can be reached on 703-3085246. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9314.

Art Unit: 2625

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-306-5631.

Ali Bayat *AB*
Patent examiner
Group Art Unit 2625
1/29/04

Timothy M. Johnson
TIMOTHY M. JOHNSON
PRIMARY EXAMINER